"Bericht über die neueren Untersuchungen am Nordlicht," by L. Végard.[2] This is a very complete bibliographic and mathematical discussion of the subject. The height of the aurora has been determined accurately by simultaneously photographing the same aurora from two stations against a common background of stars, and measuring the parallax obtained. The lower limits of the aurora vary from perhaps 85 kilometers to 170 kilometers, with two well-defined maxima, at 100 and 106 kilometers. The tops extend to heights exceeding 300 kilometers. The magnetic effects accompanying auroras show that they are owing to moving electrons, and their coming most at times of maximum sunspots shows connection with solar disturbances. The electrified particles make the luminosity. Most of the spectral lines are nitrogen lines, but the most prominent one, the "auroral line" is a greenish line of wave length not fitting any known element. The nearest line is a krypton line, but the other krypton lines are not present. [See abstract immediately following this.]

The aurora seems to be caused by electrified atoms discharged from an active area on the sun, which atoms are in part intercepted by the earth's magnetic field and guided toward the magnetic poles. As the particles follow the lines of force in the earth's magnetic field, the visible auroral streamers, which are produced by their action on the atmosphere, are practically straight lines, and therefore produce the coronal or ribbed-dome effect observed whenever an auroral arch with streamers passes through the observer's magnetic zenith.[3] The dark hole (frequently observed at the center of the corona) is the perspective effect produced on looking along the streamer lines.

The electrons have a penetrating power which can carry them through the atmosphere down only to an altitude at which the atmosphere reaches a certain density. Since the particles that form the usual aurora seem to have about equal penetrating power, the under limit is sharply defined and at about the same altitude.

When the aurora reaches a certain degree of intensity, electrical discharges take place, and first where the resistance is least, namely, in the strongly ionized air at its lower limits. The breakdown thence spreads rapidly upwards giving the impression of a rapidly upward moving wave of light.[4]

The variations in the intensity of the aurora probably depend on the varying abundance of arriving particles from the sun, as well as upon the position of the bright spots relative to the observer.—*C. F. B.*

GENERAL AURORAL ILLUMINATION OF THE SKY AND THE WAVE-LENGTH OF THE CHIEF AURORA LINE.

By V. M. SLIPHER.

[Reprinted from Science Abstracts, sec. A, Sept. 30, 1919, §1165. Abstracted from Astrophys. Jour. 49: 266–275, May, 1919.]

During the past three and one-half years about a hundred spectrograms have been made at the Lowell Observatory of the night sky, and every one of these has recorded the chief aurora line. The spectrograph, therefore, gives direct evidence of the existence of permanent auroral illumination of the sky. The close dependence of displays of aurora upon sun-spot activity suggests that there are variations in the intensity of this general illumination due to the aurora. A preliminary determination of the wave length of the aurora line indicated a longer wavelength than the commonly accepted value λ5571. Further measurements on plates obtained with a higher-dispersion spectrograph gave a mean value for the wave length of λ5578.05. The plates showed clearly that the line falls well to the red side of the strong solar line λ5573.075, and so the value λ5571 must be considerably in error. Stark [Abs. 745 (1918)] has put forward the view that the origin of the chief aurora line is probably the nitrogen pair λλ5560, 5565, but the new value obtained for the wave-length renders this view quite inadmissible.—*A. W.*

[2] Jahrbuch der Radioaktivität und Electronik, 1917, vol. 14, pp. 383–465, 7 figs., 5 tables.
[3] Cf. *Science*, May 14, 1920, N. S. vol. 51, p. 485.
[4] See the more detailed discussion by S. Chapman, "Electrical phenomena in the upper atmosphere;" reprinted in *Sci. Amer. Suppl.*, Sept. 27, and Nov. 29, 1919, pp. 198, and 323; abstracts in *Nature* (London), June 19, 1919, p. 311, and MONTHLY WEATHER REVIEW, Dec., 1919, 47: 879.

AURORA OF MARCH 4–5, 1920.

[Reprinted from Nature (London), May 13, 1920, p. 337.]

A short article in our issue of March 11, page 56, describing a magnetic disturbance which occurred on March 4–5, mentioned that aurora had been observed at Aberdeen on March 4, but considerably earlier than the commencement of the disturbance, and so presumably not directly connected with it. This seems to have been the only observation of aurora in this country on either March 4 or 5. A letter, however, which we have received from Prof. A. S. Eve, of Montreal, mentions a brilliant aurora as having been observed there between 1 a. m. and 2 a. m. G. M. T. on March 5, and so synchronous with the magnetic storm. Commencing with isolated patches, the aurora appeared for a short time in the form of an arc and ended in a curtain display. This incident leads Prof. Eve to inquire whether there is in existence "an organization for recording, with accurate timing, auroras in both northern and southern hemispheres, and, if so, where can the records be obtained?" So far as we are aware, no such records exist. The question seems to merit the consideration of the recently instituted Section of Terrestrial Magnetism and Electricity of the International Geodetic and Geophysical Union.

AURORAS OF 1919 IN THE UNITED STATES.

By HERBERT LYMAN.

[Weather Bureau, Washington, Aug. 31, 1920.]

The following tables of auroras observed in the United States during the year 1919 are based on two sources of data. First, the original monthly meteorological reports of all regular Weather Bureau stations; second, the published "Climatological Data," compiled each month by the several section centers under the supervision of the Climatological Division of the Bureau. The section reports are not, however, all uniform in the matter of listing "Miscellaneous meteorological phenomena" (under which auroras are classed) so that the tables here presented are not all-inclusive. But while there were a few instances where no record was kept of auroral displays, in the main the tables below are reasonably accurate.

Upon examining table 1, one is rather surprised to note the large number of days on which auroras were seen. Thus for the entire year there were 171 auroral displays reported—an average of one aurora to every